SECOND SEMI-ANNUAL REMEDIAL ACTION STATUS REPORT FOR 2001
NATIONAL ELECTRIC COIL SITE
HARLAN COUNTY, KENTUCKY

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TABLE OF CONTENTS

Page

1.0 Introduction 1
- 1.1 Site Location 1
- 1.2 Site History 1
- 1.3 Site Environmental Actions 2
- 1.4 Contaminants of Concern 4

2.0 Semiannual Activities 5
- 2.1 System Operation and Maintenance 5
- 2.2 Influent and Effluent Water Sampling 5
- 2.3 Influent and Effluent Air Emission Sampling 6
- 2.4 Groundwater Sampling 7

3.0 Findings 10
- 3.1 System Performance 10
  - 3.1.1 Influent Concentrations 10
  - 3.1.2 Effluent Quality 11
  - 3.1.3 Contaminant Removal 11
  - 3.1.4 Off-Gas Treatment 12
- 3.2 Groundwater Flow 13
- 3.3 Onsite Groundwater Quality 13
- 3.4 Off-Site Groundwater Quality 14
- 3.5 Time Trends 14
- 3.6 Quality Assurance/Quality Control (QA/QC) 15

4.0 Summary 16
- 4.1 Treatment System 16
- 4.2 Groundwater Flow 16
- 4.3 Analytical Results 17
- 4.4 QA/QC 18

5.0 Conclusions 19

FIGURES

1 Site Location Map
2 Facility Layout
3 Site Layout Plan
4 Monitoring Well Locations

5 Shallow Aquifer Potentiometric Surface Map
6 Intermediate Bedrock Aquifer Potentiometric Surface Map
7 Deep Bedrock Aquifer Potentiometric Surface Map
8 Groundwater Chemistry Map
9 Influent Concentration Through Time
10 CMW-5-2, VOC Concentrations Versus Time
11 CMW 5-11, VOC Concentrations Versus Time
12 CMW-7, VOC Concentrations Versus Time
13 CMW-12, VOC Concentrations Versus Time
14 CMW-85, VOC Concentrations Versus Time
15 Cumulative VOC Recovery

TABLES

1 Summary of System Maintenance
2 Summary of KPDES Effluent Limitations
3 Groundwater Monitoring Network
4 Groundwater Recovery System Efficiency
5 Air Emissions Analytical Results and System Efficiency
6 Groundwater Elevation Data
7 Summary of Groundwater Analytical Results
8 Summary of QA/QC Analytical Results

APPENDICES

A Air Analyses
B Second Semiannual 2001 Laboratory Report
C Historic Groundwater Analytical Results
D Recovery Data Summaries
E Tables from the LawGibb Group, October 2001, Remedial Action System Review
F Figures from the LawGibb Group, October 2001, Remedial Action System Review

1.0 INTRODUCTION

1.1 SITE LOCATION

The National Electric Coil (NEC) facility is situated on approximately four acres of land and is located in Dayhoit, Harlan County, Kentucky, shown on Figure 1. The facility is bordered on the west by former U.S 119, on the east by the Cumberland River, on the north by an emergency utility substation, and on the south by a trailer park property. The facility is surrounded by a chain-link fence, and is occupied by a main plant building, several smaller storage buildings, and a boiler house, shown on Figure 2. Figure 3 shows the site vicinity, including the off-site properties and the location of the Cumberland River that flows generally east to west.

1.2 SITE HISTORY

The facility was originally opened in 1951 by the McGraw-Edison Company (McGraw-Edison) and operated as a rebuilding and remanufacturing facility for coal mining and related industrial equipment including electric motors, rewinding electric coils, manufacturing, general machine shop work, and mining equipment repair. McGraw-Edison owned and operated the facility until 1985 when Cooper Industries (Cooper) purchased McGraw-Edison as a wholly-owned subsidiary. McGraw-Edison continued to operate the NEC facility until August 1987. The Treen Land Company of Brookside, Kentucky purchased the NEC building and property in August of 1987 and the operations were reopened as the National Electric Service Company. The facility operates under the National Electric Services Management Group, owned by Charles Dozier, for electrical motor repair work and limited rebuilding of hydraulic systems for the coal industry.

1.3 SITE ENVIRONMENTAL ACTIONS

In October 1990, the United States Environmental Protection Agency (USEPA) issued a Unilateral Administrative Order (UAO) (USEPA Docket No. 90-57-C) requiring immediate actions designed to mitigate the release of hazardous substances from the site. Cooper subsequently contracted with Law Engineering & Environmental Services (Law) to develop and implement a Remedial Action Plan (RAP) in accordance with the USEPA's UAO. As part of the RAP, Law installed monitoring wells at the site to evaluate the magnitude of the groundwater contamination.

The NEC site was proposed for inclusion on the National Priority List (NPL) on July 29, 1991 and the site was placed on the NPL on October 14, 1992. USEPA and Cooper entered into an Administrative Order by Consent for a Remedial Investigation/Feasibility Study (RI/FS) in May 1992. The USEPA issued a UAO on December 15, 1992, directing Cooper to perform the Interim Remedial Design/ Interim Remedial Action (RA), described in the Record of Decision (ROD), concurrently with the RI/FS to capture groundwater containing chlorinated volatile organic compounds (VOCs).

The original groundwater recovery and treatment system was activated in July 1993 and consisted of an on-site Recovery Well CMW-5-11 located in the deeper bedrock aquifer zone (at an approximate depth of 120 feet), an equalization tank, an air stripping tower, and a 10,000 pound activated carbon unit to treat the air stripper off-gas.

An additional RA was implemented at the site to address impacted groundwater in accordance with the April 26, 1996 ROD and the May 20, 1996 UAO issued to

Cooper by the USEPA. A RA Report (March 4, 1998) was submitted to document the implementation and initial start-up activities associated with the RA system. The RA system consisted of the installation of groundwater recovery systems located in the shallow alluvial aquifer and the intermediate and deeper zones of the underlying bedrock aquifer, and the installation of a treatment system to remove the VOCs from the extracted groundwater using air stripping technology. The air stripper off-gases are treated through a catalytic oxidation system prior to being discharged into the atmosphere via a 60-foot tall air stack.

The final groundwater recovery system consisted of the installation of four recovery units: an interceptor trench located in the shallow alluvial aquifer (approximately 190 feet long and 24 feet deep); Recovery Well R-2 located in the intermediate bedrock aquifer zone (approximately 80 feet deep); Recovery Well CMW-5-2A located in the deeper bedrock aquifer zone (approximately 125 feet deep); and existing Recovery Well CMW-5-11 (approximately 120 feet deep) located in the deeper bedrock aquifer zone.

The final groundwater treatment system consisted of a 2,000-gallon double-walled equalization tank, the existing air stripper tower, and a catalytic oxidation system to treat the off-gases from the air stripping tower, in accordance with the EPA approved air emission performance standards. Treated water from the air stripper continues to be discharged to the Cumberland River in compliance with the requirements of a KPDES permit. The layout of the remediation system is shown on Figure 2.

The final RA implementation was conducted between September 1997 and February 1998. The final groundwater recovery systems and the catalytic oxidation unit started up in February 1998.

1.4 CONTAMINANTS OF CONCERN

Historically, several VOCs have been detected in the groundwater samples collected from the site, however the contaminants with the highest concentrations detected include trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), vinyl chloride, and 1,1-DCE. The contaminants of concern and their respective maximum contaminant levels (MCLs) are listed below:

Contaminant	MCL (ug/l)
TCE	5
Cis-1,2-DCE	70
Trans-1,2-DCE	100
Vinyl Chloride	2
1,1-DCE	7

2.0 SEMIANNUAL ACTIVITIES

2.1 SYSTEM OPERATION AND MAINTENANCE

Civil & Environmental Consultants, Inc. (CEC) and Eastern Well and Pump conducted routine monthly monitoring of the groundwater remediation system. The operations and maintenance of the groundwater remediation system are performed by Eastern Well & Pump. Table 1 summarizes the maintenance conducted from July through December 2001. The system was shut down for seven hours in November for system maintenance and greasing of the motors. No major problems were encountered during the period. Maintenance activities included repairs to instrumentation, electrical repairs, disinfecting the receiving wells with bleach, winterization of the equipment, and routine maintenance of the equipment and pumps.

2.2 INFLUENT AND EFFLUENT WATER SAMPLING

Operation of the remediation system is subject to federal and state requirements. The KYDEP Water Resources Branch, Division of Water, in a letter dated March 6, 1996, set forth the requirements for the NEC site for groundwater withdrawal and pumping from the three aquifer zones. The authorization letter permits total recovery rates to a maximum of 250 gpm (0.360 mgd) from all of the aquifer zones. The groundwater recovery system was pumped at a rate between 79 to 167 gpm, with an average of 131 gpm for the reporting period.

Monitoring of the discharged groundwater has continued during the operation of the RA to demonstrate continued compliance with the KPDES requirements. A KPDES permit was granted for the discharge of water from the treatment system

and is effective from February 1, 1997 through February 1, 2002. A modified permit was issued by the KYDEP on December 20, 1999, which became effective on February 1, 2000. The modified permit allowed for monthly monitoring of the effluent water, eliminated the need for PCB analysis, and eliminated the need for the diffuser pipe. The new permit establishes discharge limitations and monitoring and reporting requirements (Table 2). Cooper submitted a new KPDES application to the KYDEP on July 30, 2001.

The KYDEP Water Resources Branch, Division of Water, issued Cooper a new KPDES permit on December 21, 2001. The new permit is effective from March 2002 through August 2003. The permit duration is abbreviated to allow KYDEP to synchronize this facility with other permit grantees in the watershed. The permitted groundwater withdrawal rate of 250 gpm is unchanged; however, the daily maximum system discharge limits have been removed. Metals limits for the effluent have been removed. All other effluent limitations remain unchanged. A revised table of effluent limitations will be submitted with the first 2002 semi-annual report.

Influent and effluent water samples were collected monthly to monitor the treatment efficiency of the air stripper. A total of six samples were collected during the second half of 2001. Samples were analyzed for VOCs by Antech Ltd. using USEPA Method 8260.

2.3 INFLUENT AND EFFLUENT AIR EMISSION SAMPLING

The KYDEP has not established limits for air emissions from the treatment system and does not require an air permit. However, the USEPA has developed emission rates and ambient air performance standards for the RA system as follows:

Cis-1,2-DCE	5,850,000 ppbv
TCE	19,600 ppbv
Vinyl Chloride	837 ppbv

Performance standards were established in the ROD, with limitations on the discharge of TCE, cis-1,2-DCE, and vinyl chloride. The point of compliance for the emission rate standards is the discharge end of the 60-foot air exhaust stack, after the catalytic oxidation unit.

The air emissions exiting the air exhaust stack were monitored during the initial start up of the RA off-gas system to demonstrate compliance of the catalytic oxidation treatment system with the USEPA emission rate performance standards. Monitoring of the air exhaust emissions exiting the stack has continued on a monthly basis during the operation of the RA to demonstrate continued compliance with USEPA's air emission performance standards.

The groundwater recovery off-gas catalytic oxidation treatment system operated during the operation of the stripper system. Both influent air and effluent air were sampled in October, November and December during the reporting period. Samples were collected in Summa canisters with flow-control valves and analyzed by Severn Trent in Houston, Texas, for VOCs using USEPA Method TO-14 (Appendix A).

2.4 GROUNDWATER SAMPLING

Cooper conducts routine groundwater monitoring on a semiannual basis. The purpose is to evaluate the concentrations of VOCs in groundwater with respect to time, and to measure the effectiveness of the groundwater recovery and treatment

system. The groundwater monitoring system for the NEC site is summarized in Table 3.

The second semiannual sampling event was conducted on September 11 and 12, 2001 by CEC. Activities included water level measurement in 23 monitoring wells, as well as an onsite sump, and the collection of 13 groundwater samples. Groundwater monitoring well locations are shown on Figure 4.

Conventional groundwater sampling procedures and protocols were used in conducting the monitoring. Groundwater levels were measured within each monitoring well to determine groundwater elevations for the development of groundwater elevation contour maps, and to identify groundwater flow directions.

Prior to sampling of each monitoring well, a minimum of three well volumes of water were removed from the wells (unless the wells are recovery wells used for pumping groundwater), and disposed through the facility treatment system. Samples for laboratory analysis were collected in laboratory-prepared VOA vials containing an appropriate amount of preservative. Vials were filled without headspace or air bubbles. Samples were packaged in shuttles containing ice packs for shipment to the analytical laboratory. Chain-of-custody protocol was adhered to during all phases of sample collection, transportation and delivery to the laboratory. Antech Ltd. of Export, Pennsylvania, analyzed the groundwater samples.

During the September 2001 sampling event, four QA samples were collected. QA samples included a trip blank, an equipment blank, a duplicate sample from CMW-12 (Duplicate) and a field blank. The trip blank was prepared by the analytical laboratory prior to shipping the sample bottles, and accompanied the sample bottles throughout the entire sampling process. The equipment blank was collected by

pouring deionized water over sampling equipment after it had been decontaminated, and was collected to evaluate the effectiveness of the decontamination procedures. The duplicate sample was collected to evaluate laboratory analytical procedures. The field blank was collected to evaluate the ambient air conditions at the time of sampling.

3.0 FINDINGS

3.1 SYSTEM PERFORMANCE

The recovery system treated and discharged 35million gallons of water during this reporting period (Table 4 and Appendix D). The LawGibb Group (Law) is evaluating the influent and effluent air samples from the cat-ox system. Some of the tables and figures from their initial evaluation are presented in Appendices E and F, respectively. The average flow rates for the recovery system during the reporting period were approximately:

Shallow aquifer (interceptor trench)	1 gpm
Intermediate bedrock aquifer (R-2)	16 gpm
Deep bedrock aquifer (CMW-5-2A, CMW-5-11)	114 gpm

These flows were determined by totalizing flow meters at the treatment plant.

Based on these measurements, the average total pumping rate of the system was approximately 131 gpm, which is below the KPDES permit limit of 250 gpm.

The remediation system was down for seven hours in November for routine maintenance and greasing of the motors. Table 1 summarizes the system maintenance during this six-month period.

3.1.1 Influent Concentrations

Table 4 summarizes the analyses of untreated influent for the second half of 2001. The cis-1,2-DCE ranged from 690 ppb in July to 360 ppb in October. TCE values

fluctuated from a low of 29 ug/l in October and a high of 400 ug/l in August. Vinyl chloride concentrations fluctuated from a low of 19 ug/l in September and a high of 61 ug/l in July.(Figure 9).

Contaminant concentration levels in the air stripper influent water through time are summarized on Figure 9. Influent water quality for the treatment system has exhibited an overall decreasing trend since the final remediation system was started up in February 1998; however, concentrations reached a two-year high in August 2001 due to increased pumping at recovery well 5-11 and low precipitation in this area.

3.1.2 Effluent Quality

System effluent concentrations for the reporting period are also summarized in Table 4. All measurements of cis-1,2-DCE, TCE, and vinyl chloride complied with the KPDES permit effluent limits for the daily maximum. Furthermore, monthly average concentrations complied with the monthly average limit specified in the permit. The average removal efficiency for the air stripper was 94% (Table 4).

3.1.3 Contaminant Removal

Table 4 indicates that approximately 1191 pounds of VOCs were removed from the groundwater system during the second half of 2001. This total includes approximately 93 pounds of cis-1,2-DCE, 37 pounds of TCE, and 6 pounds of vinyl chloride. Since January 1997, approximately 1,954 pounds of VOCs have been removed (Appendix D).

3.1.4 Off-Gas Treatment

Table 5 summarizes analyses of the air stripper exhaust gas (cat-ox influent) and the cat-ox air stack effluent for the reporting period. Concentrations in both the influent and stack effluent samples were well below the standards established by EPA in the ROD. Cooper has retained Law to evaluate the cat-ox system at the site. Some of the tables and figures that were prepared by Law are presented in Appendices E and F, respectively. As shown on the tables and graphs, the influent concentrations have been significantly below the effluent standards.

For this reporting period, Cooper used the maximum cat-ox system influent concentration for each compound analyzed during the second half of 2001 in determining the percentage of air emission with respect to the standard. For cis-1,2-DCE, TCE, and vinyl chloride, the maximum concentrations were measured in December. The 2,260 ppbv value for cis-1,2-DCE equates to 0.04 percent of the 5,850,000 ppbv standard. The 790 ppbv value for TCE represents 4.03 percent of the 19,600 ppbv standard and the 266 ppbv value for vinyl chloride equates to 31.8 percent of the 837 ppbv standard. Because the untreated air emissions from the air stripper continue to meet the required emission standards and are less than 32% of the EPA air emission limit, Cooper believes operation of the cat-ox unit should be discontinued and will request permission from EPA as part of the five-year review to discontinue operation of the cat-ox unit.

As shown on Table 5, the cat-ox treatment system removed over 99.5% of the VOC contaminants from the air stream.

3.2 GROUNDWATER FLOW

Groundwater level measurements were obtained from 23 monitoring wells, plus the onsite sump, during this semiannual monitoring event (Table 6).

The groundwater elevations were used to generate groundwater contour maps of the shallow, intermediate and deep aquifers. Groundwater flow in the shallow aquifer shows the effects of the recovery trench (Figure 5) with the trench capturing groundwater in the central portion of the facility and wells downgradient of the trench being dry.

Data for the intermediate aquifer during this reporting period are presented on Figure 6. Dashed contours are included where groundwater elevations are inferred based on historic data from previous pumping tests that have demonstrated that a capture zone has been developed around intermediate pumping well R-2.

Data for the deep aquifer (Figure 7) indicates the presence of an elongated cone of depression surrounding the deep pumping wells, CMW-5-2A and CMW-5-11, and extending toward wells CMW-12A and CWM-85. This flow pattern indicates effective capture of contaminants in the deeper zone.

3.3 ONSITE GROUNDWATER QUALITY

The analytical results for the monitoring and extraction wells, and trench samples are summarized on Table 7 and Figure 8. The complete analytical report is presented in Appendix B. Samples were collected from the interceptor trench in the shallow aquifer, recovery well R-2 in the intermediate aquifer, and two recovery wells (CMW-5-11 and CMW-5-2A) in the deeper aquifer. TCE, cis-1,2-DCE, and

vinyl chloride were detected at concentrations above their MCLs in deep wells CMW-5-2 and 5-2A. Elevated chloroform in well CMW-5-2 is a result of chlorination to prevent biofouling and therefore should not be considered as a source-derived contaminant. The intermediate well R-2 contained TCE and cis-1,2-DCE. The trench contained cis-1,2-DCE and TCE above the MCL.

Consistent with previous sampling data, the presence of cis-1,2-DCE and vinyl chloride indicate the probable presence of natural biodegradation processes occurring in the aquifer. Furthermore, dechlorination of TCE is very evident with depth in the aquifer, based on Table 7 and Figure 8.

3.4 OFF-SITE GROUNDWATER QUALITY

The second semiannual sampling results are summarized in Table 7 and Figure 8. Complete analytical results are presented in Appendix B. Off-site wells sampled during the reporting period were CMW-6, CMW-7, CMW-9, CMW-12, CMW-12-16, CMW-13, and CMW-85.

Concentrations of constituents in excess of MCLs were detected in only two off-site wells, CMW-7 and CMW-12. TCE, cis-1,2-DCE and vinyl chloride were detected in well CMW-7 above its MCLs. Only cis-1,2-DCE and vinyl chloride were detected in well CMW-12 at levels slightly above MCLs. The detected values were within historic ranges (Appendix C).

3.5 TIME TRENDS

Water quality data for the influent groundwater and wells CMW-5-2, CMW-5-11, CMW-7, and CMW-12 were reviewed for trends (Figures 7 through 14). The historic

analytical database for the site is presented in Appendix C. The concentration levels are consistent with historic data or the past few years.

The cumulative VOC mass recovered is shown on Figure 15. The trend of continuous increase clearly indicates the effectiveness of the system in removing VOCs, and should continue operation.

3.6 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Analytical results for quality assurance samples are presented in Table 8. Low levels of acetone were detected in equipment and field blank samples. Acetone has not historically been associated with the site, and the detections do not appear to be representative of the actual site conditions.

The results for CMW-12 and the duplicate sample are within acceptable limits (±10%).

4.0 SUMMARY

4.1 TREATMENT SYSTEM

The groundwater treatment system continues to be effective at removing VOCs from the groundwater extracted from the shallow, intermediate, and deep aquifer recovery systems. Approximately 35 million gallons of impacted groundwater were removed during this period, at an average combined flow of 131 gpm. A total of 191 pounds of VOCs were removed from the shallow, intermediate and deep aquifer zones. The final RA system was started in 1993 and updated in February 1997. Since startup of the system, approximately 3,602 pounds of VOCs have been removed from the aquifer.

During the reporting period, the air stripper system operated at approximately 94% removal efficiency. The analytical results of effluent water samples collected from air stripper Outfall 001 were well within KPDES compliance limits.

The off-gases from the air stripper were treated through a catalytic oxidation system. The catalytic oxidation system removed over 99.5% of the influent gases of concern (cis-1,2-DCE, TCE, and vinyl chloride). Influent, as well as effluent, air emission analytical results met the required EPA air emission standards for each VOC compound of concern.

4.2 GROUNDWATER FLOW

The groundwater contour maps generated for the shallow and deep aquifers indicate that the recovery system is effectively capturing and remediating the contaminated groundwater. In the shallow aquifer, the groundwater appears to be

captured by the trench system. Historic data demonstrate capture in the intermediate aquifer. The capture zone developed in the deep zone extends beyond the leading edge of the plume in this zone beyond the Cumberland River toward well 8-S, nearly 2,000 feet from the site. This finding indicates that the system is not only controlling the plume's movement, but is also retracting and remediating the remaining groundwater contamination.

4.3 ANALYTICAL RESULTS

Samples collected from the groundwater recovery extraction points (Trench, R-2, CMW-5-2A and CMW-11) and in the influent water to the air stripper detected the presence of elevated concentrations of cis-1,2-DCE, TCE, and vinyl chloride. The rates of concentration decreased in the recovery and monitoring wells have slowed since the final upgraded upgraded system started up in February 1998, as is typical of these systems; however, the cumulative mass of VOCs removed is still increasing (Figure 15). The presence of the degradation products of TCE (cis-1,2-DCE and vinyl chloride) indicates that biodegradation is likely occurring in the aquifers and is actively supporting natural attenuation of the plume.

The groundwater results from the off-site wells in the deep aquifer indicate that off-site migration of contaminants is being controlled and mitigated by the remediation system. For example, the only off-site wells exhibiting constituent concentrations in excess of the MCLs were wells CMW-7 and CMW-12. Monitoring well CMW-8S, located across the Cumberland River, was nondetect for VOCs.

4.4 QA/QC

The QA/QC samples collected during this sampling event were within acceptable limits. The duplicate sample collected from Well CMW-12 contained contaminant concentrations within 10% of the original sample. The field, equipment, and trip blank samples were free of VOCs of concern, except for acetone, a laboratory artifact that has not been detected as a contaminant at this site.

5.0 CONCLUSIONS

The groundwater recovery system is effectively removing contaminants from the impacted shallow, intermediate, and deep aquifers. The system also appears to be controlling the off-site migration of the contaminants and retracting the contaminant VOC plume. Water-quality data also show that natural attenuation is occurring in the aquifers.

The continued operation of the groundwater remediation treatment system along with the monthly monitoring and maintenance of the remediation system will continue to remediate the aquifers. Cooper will be evaluating alternative pumping schedules in the future to attempt to increase contaminant removal rates as part of the five-year review with EPA and KYDEP.

Influent air samples collected from the system since May 1998 have been consistently below the USEPA air emission limits. This represents 12 consecutive quarters of influent air data. Based on the influent air concentrations being consistently below the limits and the continued decrease in groundwater concentrations, Cooper believes that discontinuation of the catalytic oxidation system would not affect the ability to remove contaminants or meet the objectives set forth by USEPA or KYDEP.

Based on the consistency of the data, and groundwater monitoring data available since 1993, we recommend that annual reports be submitted to the KYDEP and EPA.